EQUISETUM PALUSTRE, EXAMPLE OF CARELESS BIBLIOGRAPHY AND PHYTOGRAPHY

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Finding myself obliged to learn something, aside from 55 years of field-experience, of the correct names and characters of the more striking vegetative forms of *Equisetum palustre* L. Sp. Pl. 1061 (1753), I have automatically turned to such usually authoritative works as those of Milde, Klinge and Luerssen in Europe, and the supposedly critical work of Marie-Victorin in America. The further I have tried to follow their guidance the deeper I have got into the morass (*palus*) where the species chiefly occurs, or, as my friend, Dr. Arthur Stanley Pease, remarks, in trying to pull the snarls out of a horse-tail I have got into a mare's nest! This is not because of the heterogeneous variation, for the vegetative forms under which the species disguises itself both in Eurasia and North America, can mostly be easily recognized, when one has the fundamental *specific* characters in mind. The difficulties are largely the utter confusion as to the minor categories, so that recent authors, who should know better, cite earlier students as calling variations *formae* when they had not done so, or, still more puzzling, ascribe to authors statements which, apparently, they did not make. A further matter, most difficult to understand, is the separation by Marie-Victorin of the American plants, as distinguished from the Eurasian, on supposed (and illustrated) characters which I am quite incapable of making out.

Discussing first the last of the points above mentioned, in order somewhat to clear the field, we have Marie-Victorin's thesis, in his Équisétinées du Québec, Contrib. Lab. Bot. Univ. Montréal, no. 9: 50–63, figs. 6–13 (1927), that the American plants differ from the Eurasian true *Equisetum palustre* because, he says, the latter has the teeth of the primary (cauline) sheaths "ovate-lanceolate, obtuse, generally shorter than the tube, broadly white-margined (des gaines munies de 6–8 dents ovées-lancéolées obtuses, généralement moins longue que les gaines, largement marginées de blanc)"; whereas the American plant has the teeth longer than the tube of the sheath and narrowly linear-lanceolate, acuminate, acute, with the white margin very

narrow (pp. 50 and 51). This contrast is certainly a most difficult one to find supported by the Eurasian specimens, the descriptions by the most accurate European students and the better European plates. Thus Milde, Mon. Equiset. 325, said: "Zähne breit-lanzettförmig-zugespitzt, breit weisshäutig-gerandet, zum grössten Theile schwarz"; and Luerssen, Die Farnpfl. described the Zähnen as "breit lanzettlichen zugespitzten". Although sometimes in the American specimens the teeth are as long as or longer than the tube of the sheath, the difference is not sufficiently constant to be convincing; similarly, although the white scarious margin is commonly narrower than in most European specimens, broad margins occur in North America and narrow margins in Europe. Altogether, these very trivial differences, too often breaking down on both continents, support the conclusion of the late A. A. Eaton in Fern Bull. ix. 62 (1901) that these "and various other [unstated] minor differences might be noted, but hardly enough to justify its erection into a geographical variety, at least until the differences are found to be constant." Surely the supposed differences emphasized by Marie-Victorin are anything but constant.

The vegetative fluctuations of *Equisetum palustre* are bafflingly numerous and some authors, for instance the very careful Douval-Jouve, Hist. Nat. Equisetum de France, 202 (1864), have asserted that they may arise from the same rhizome and are not recurrent in different years ("Les variations extrêmes de cette espèce n'ont pas assez de permanence pour être citées comme variétés; elle ne persistent pas d'une année à l'autre et on les trouve quelquefois toutes sur un seul et même rhizome"). Everyone in recent years seems to agree that these vegetative forms should be treated as formae, not as true geographic varieties; but they have very generally disregarded the elementary fact that nomenclaturally and taxonomically variations published as varieties cannot be properly ascribed to their original authors as their forms. For instance, one of the most striking of forms is a series of plants, well known to pre-Linnean botanists and very definite in having the numerous strongly ascending branches cone-bearing at tip. This was *E. palustre* "β. Equisetum palustre minus polystachyon. *Bauh. pin.* 16", etc. of L. l. c. (1753). In 1789 in his Hist. Pl. Dauphiné, iii. pt. 2: 835 (1789) Villars had

essentially the same treatment, *E. palustre* L. and "B. *Equisetum minus polystachion*. B[auhin]. *pin*. 16" etc., whereupon Milde, Höheren Sporenpfl. 110 (1865) and in his more extensive Mon. Equiset. 329 (1865) cites in the former *E. palustre*, var. "polystachyum Vill." and in the latter *E. palustre*, var. **"polystachium Vill. hist. pl. Dauph. 1786"** (the date of vol. i, not vol. iii); others, therefore, citing "var. *polystachium* Vill." as published in vol. i, although Villars in vol. iii had, as noted above, merely repeated the polynomial of Bauhin and other early authors, just as Linnaeus had originally done. Apparently the first formal taking up of the tricky name was by Weigel, Fl. Pomerano-Rugica, 187 (1769), where it appeared in proper modern form as *E. palustre*, (B) *polystachion*, with a detailed description. Consequently, following the easy-going technique, it appears in Rouy, Fl. France, xiv. 499 (1913) as var. *polystachyum* (not *polystachion*) Weigel!

Milde, taking up var. *polystachium* as of Villars, who, as just pointed out, merely used the pre-Linnean polynomial phrase, divided it into two forms: "*a*) *Forma corymbosa*. Syn. E. corymbosum Bory. msc. Spicae ramorum in formam corymbi dispositae"; and "*b*) *Forma racemosa*." Those were clearly designated as *formae*. The International Rules specify without quibble that under each category (species, variety or form) we must use the first name adequately published for the plant in each category, regardless of whether it is antedated by an older name in another category. Luerssen, l. c., cites them as "forma polystachya Villars" (Villars having merely used the old phrase of Bauhin: *Equisetum minus polystachion*) and then ascribed to Milde the "Unterformen" (subforms) **"forma racemosa** Milde" and **"forma corymbosa** Milde", quite regardless of Milde's own treatment. I am aware, as is everyone who has looked into German and Germanic taxonomic treatments of the past (and too often of the present), of the utter confusion there made of the categories and the easy-going freedom with which the groupings of cited authors are distorted. Nevertheless, if the rule that we must take up the first name used within the accepted category is followed, we can only occasionally accept much which purports to be authoritative in continental European bibliography. Without such a rule the confusion would be worse. Most

fortunately, in the case of forma *polystachion* (Weigel), it was properly treated in 1864 as forma *polystachyon* Duval-Jouve, l. c. 247 (1864), and that combination seems to have right-of-way. Incidentally, as shown in the next item, those who work on *Equisetum* would find a treatise of unusual accuracy in the volume by Duval-Jouve.

The discussion of many other such lapses or failures to follow exact bibliographic details in the case of *Equisetum palustre* may be deferred to the comments under the forms at the end of this paper, but two are so typical of the muddy thinking which is too common that they may here be noted. In his detailed paper Marie-Victorin in 1927 sets up as a brand-new variety his *E. palustre*, var. *americanum* (p. 51); then he defines under it some formae, the first of these being "f. **luxurians** n. f. Syn.: *E. palustre* var. *ramosissimum* Peck Rep. N. Y. State Mus. **25:** 107. 1871". Obviously, if Marie-Victorin considered Peck's var. *ramosissimum* (1871) identical with a form of his var. *americanum*, he should have used that name for the variety. Again, Broun, Index N. Am. Ferns, 91 (1938), explicitly stating that true *E. palustre* is "A Eurasian species, represented in North America by: Var. **americanum** Victorin", proceeds on p. 92 to publish **"Var. americanum forma tenue** (Döll) n. comb.", this based on "var. *tenue* Döll, Rhein. Fl. 29. 1843." Quite obviously the name var. *tenue* (1843) antedates by more than three fourths of a century the varietal name given by Victorin and accepted by Broun. Incidentally, if the Eurasian *E. palustre* and its varieties and forms do not occur in America, how does Döll's var. *tenue* from Germany happen to belong under the professedly distinct North American var. *americanum*? Finally, the correct combination, *E. palustre* forma *tenue* (but as *tenuis*, following the very general old custom of making it agree in gender with *forma*) (Döll) Duval-Jouve, l. c. 248 (1864) antedates by 74 years the superfluous combination of Broun.

As I understand the forms of *Equisetum palustre* which have been found in North America, they may be distinguished as follows. It should be said, however, that the weeks of bibliographic research necessary to unsnarl the very confused Old World treatments might lead to the adopting of somewhat different combinations.

a. Stem with whorls or tufts of branches borne regularly from the nodes. . . . *b.*
b. Nodal branches all simple. . . . *c.*
c. Stem erect, with 3–many branches diverging symmetrically as whorls. . . . *d.*
d. Cone borne only from summit of stem. . . . *e.*
e. Branches from median and upper nodes (above submerged-level) strongly arched-ascending to suberect. . . . *f.*
f. Branches 1.5–6 cm. long
Teeth of sheaths white-margined. . . . *E. palustre* (typical).
Teeth blackish, without white margins. . . . forma *nigridens.*
f. Branches 0.7–3 dm. long, very strongly ascending. . . . . forma *verticillatum.*
e. Branches from median and upper nodes horizontally or subhorizontally divergent. . . . . forma *arcuatum.*
d. Cones borne at tips of many ascending branches forma *polystachion.*
c. Stem prostrate, greatly elongate, its elongate (up to 4 dm.) strongly ascending or erect branches mostly in pairs (1–5). . . . . forma *fluitans.*
b. Nodal branches (at least the lower ones) with short branchlets. . . . . forma *ramulosum.*
a. Branches only 1 or 2 (rarely 3) at a node, irregularly scattered, or none.
Main or principal stem elongate, with many nodes, 2–4 mm. thick, with or without more slender secondary stems. . . . . forma *simplex.*
Main axis nearly suppressed, the very numerous slender erect stems or branches nearly uniform and 1–2 mm. thick. . . . . forma *filiforme.*

EQUISETUM PALUSTRE L. Sp. Pl. 1061 (1753); Duval-Jouve, Hist. Nat. Equiset. 246 (1864) with detailed European bibliographic citations; Milde, Mon. Equiset., t. xiii, fig. 4 ("Normale, gewöhnliche Form"). Forma *verticillatum* Milde, forma a. *breviramosum* Klinge in Archiv. Naturk. Liv.-Esth. u. Kurland, ser. 2, viii. 401 (1882); Luerss. Farnpfl. 709 (1889). Var. *americanum* Victorin, Équisét. Quebec, Contrib. Lab. Bot. Univ. Montréal, no. 9: 51 (1927) in part, not the type.

Marie-Victorin, l. c. 50, seems to have misunderstood the Linnaean description, for he there writes: "La diagnose princeps de l'*E. palustre: E. caule angulato, frondibus simplicibus* [with reference to L. Sp. 1061] indique comme type une plante dépourvue de rameaux". Although, according to Victorin, quoting Newman, the material preserved in the Linnaean Herbarium is confused and inadequate, it is evident that by "frondibus", as opposed to "caule", Linnaeus referred to the branches. Note his original description, drawn from his Flora Suecica, of *E. sylvaticum:* "EQUISETUM caule spicato, frondibus compositis", the latter phrase clearly referring to the characteristically much

forked branches. Note also the other references given by Linnaeus for his *E. palustre: E. setis simplicibus internodia vix superantibus* of Royen, Flora Suecica and Dalibard: *E. palustre* of Flora Lapponica, where the Royen phrase-name was given; and Bauhin's *E. palustre, brevioribus setis.* Others of Linnaeus's diagnoses indicate the same meaning of frondibus: *E.* "*arvense* scapo fructificante nudo, sterili frondoso", etc.

Forma NIGRIDENS (St. John) Victorin. Var. *nigridens* St. John, Bot. Expl. Gulf St. Lawr. Reg.—Victoria Mem. Mus. Mem. 126: 42 (1922). Var. *americanum* forma *nigridens* (St. John) Victorin, l. c. 63 (1927).

A local form with the usual white margins of the teeth lacking.

Forma VERTICILLATUM Milde, Gefäss-Cryptog. Schles.—Nov. Act. Acad. Caes. Leopold.-Carol. Nat. Cur. xxvi. 460 (1858). Forma *verticillatum* forma b. *longeramosum* Klinge, l. c. 402 (1882). Forma *longiramosa* Luerss. l. c. 709 (1889). Var. *americanum* Victorin, forma *luxurians* Victorin, l. c. 56, in part (excl. synonym and type).

Milde's forma *verticillatum* was clearly described with "die Aeste in der Mitte des Stengels 2½"-5" (6.6–14.8 cm.) long, thus coming into the lower range of the form with long ascending branches. Although Milde, with absolute definiteness, published his "*Forma verticillatum*" in 1858, Klinge in 1882 marched in with forma "1. **verticillatum** (f. n.)" and under it "a. **breviramosum** (f. n.)" and "b. **longeramosum** (f. n.)"; and Luerssen, likewise had the two latter forms as **"forma breviramosa** Klinge" and **"forma longiramosa** Klinge" subordinate to **"forma verticillata** Milde". If they intended these and some others as *subforms* they surely did not say so. Forma *longeramosum* was assigned by its author upright ("aufrecht") branches up to 30 cm. long. Forma *verticillatum* (*f. longeramosum*) is the most common form in North America, the specimens before me being twice as numerous as are those of typical *E. palustre.*

Forma ARCUATUM Milde, Gefäss-Cryptog. Schles.—Nov. Act. Acad. Caes. Leopold.-Carol. Nat. Cur. xxvi. 461 (1858). *E. palustre,* 4. *arcuatum* Milde, Höheren Sporenpfl. 109 (1865). Var. *arcuatum* Milde, Mon. Equiset. 328, t. xiii, fig. 1 (1865). Var. *americanum,* f. *luxurians* Victorin, l. c. 56, fig. 11 on p. 59 (1927).

Forma *arcuatum*, relatively infrequent, has the median and upper whorls of branches horizontally or subhorizontally divergent, varying from 0.4–2 dm. or more long, thus being like forma *verticillatum* and typical short-branched *E. palustre* but with wide-spreading branches. The very extreme plant originally described by Milde had the branches arching downward ("bogig herabgekrümmt") and "bis 4" (1 dm.) long. Much of the material cited by Marie-Victorin as his f. *luxurians* is characteristic f. *verticillatum* but the isotype before me and his illustration are f. *arcuatum*. Incidentally, though really important, in setting up his forma *luxurians* Marie-Victorin cited without a word of doubt the var. *ramosissimum* of Peck (see p. 281), but forma *luxurians*, as described, as shown by an isotype and as illustrated with the original publication, has quite simple branches, whereas in Peck's var. *ramosissimum* "the branches are themselves furnished with branchlets." In other words it belongs to forma *ramulosum* Milde. Furthermore, if the author of the newly proposed var. *americanum* (1927) thought that it included var. *ramosissimum* (1871) he should have taken for the variety the first name in that category as conceived by him.

Forma POLYSTACHION (Weigel) Duval-Jouve, Hist. Nat. Equiset. 247 (1864) as f. *polystachyon*. *E. palustre* β. *Equisetum palustre minus polystachyon* L. Sp. Pl. 1061 (1753); Villars, Hist. Pl. Dauph. iii². 835 (1789). *E. palustre*, (B) *polystachion* Weigel, Fl. Pomerano-Rugica, 187 (1769). *E. palustre*, 7. *polystachyum* "Vill." with forma *corymbosa* (Bory ex Milde) and f. *racemosa* Milde, Höheren Sporenpfl. 110 (1865). *E. corymbosum* Bory ex Milde, l. c. (1865). Var. *casuarinaeforme* Schur as syn. ex Milde, l. c. (1865). Var. *polystachium* A. Br. in Am. Journ. Sci. xlvi. 85 (1844); "Vill." ex Milde, Mon. Equiset. 329 (1865) including f. *corymbosa* and f. *racemosa*. Further twists of the bibliography by various later students include such distortions by Klinge as forma "**polystachium** Vill. . . . a. **corymbosum Bory** (als Art)". See p. 280.

A very striking but relatively rare form, comparable with *E. arvense* L., f. *campestre* (C. F. Schultz) Klinge.

Forma FLUITANS Victorin. Var. *americanum*, f. *fluitans* Victorin, l. c. 60, fig. 13 on p. 62 (1927).

The ascending, slender branches, borne unilaterally on the prostrate and sometimes rooting stem, often exceed Marie-Victorin's 5–10 cm. In *Fernald, Long & Fogg*, no. 1185 from

Main River, Bonne Bay, Newfoundland, they reach a length of 3.5 dm.; in A. A. Eaton, no. 42, from Fort Kent, Maine, they are more numerous and up to 4 dm. long.

Forma RAMULOSUM (Milde) Klinge, l. c. 404 (1882), wrongly ascribed to Milde. Forma *ramulosa* Luerss. l. c. 710 (1889), wrongly ascribed to Milde. *E. palustre*, 5. *ramulosum* Milde, Höheren Sproenpfl. 109 (1865). Var. *ramulosum* Milde, Mon. Equiset. 328 (1865). Var. *ramosissimum* Peck, Ann. Rep. N. Y. State Mus. Nat. Hist. 107 (1873). Var. *americanum*, f. *ramosissimum* (Peck) Broun, Index N. Am. Ferns, 92 (1938).

Milde's original brief description, "Aeste unter ihren Scheiden je 1–2 secundäre Aestchen tragend; Stengel sehr schlaff, fast niederliegend," was later expanded in his Monograph where he said the flaccid stem climbed among bushes and was 1½–3 feet tall. Such American specimens as I have seen are smaller: *A. A. Eaton's* no. 130 from Fort Kent, Maine, being only 2.5 dm. high; *Fernald & Long*, no. 12,312 from Fairfield, Maine, slightly more than 4.5 dm. high, with the slightly forking and divergent branches up to 2 dm. long.

Forma SIMPLEX Milde, Gefäss-Crypt. 460 (1858). Var. *tenue* Döll, Rhein. Fl. 29 (1843); Milde, Mon. Equiset. 327, t. xiii. figs. 2 and 3 (1865). Var. *simplicissimum* A. Br. in Am. Journ. Sci. xlvi. 85 (1844). Forma *tenue* (as *is*) (Döll) Duval-Jouve, l. c. 248 (1864). Forma *simplicissima* (A. Br.) Luerss. l. c. 712 (1889), wrongly ascribed to A. Br. Var. *americanum* Victorin, l. c. 51 (1927) in part, including type. Var. *americanum*, forma *tenue* (Döll) Broun, Index N. Am. Ferns, 92 (1928).

Marie-Victorin, having conceived true or typical *Equisetum palustre* L. as the extreme form without branches or with them few, short and irregularly disposed, i. e. forma *simplex*, he logically selected as the type of his var. *americanum* a similar American plant. His description calls for "rami nulli, vel aliter pauci et irregulariter verticillati". The isotype of var. *americanum* in the Gray Herbarium is easily matched by European specimens. The fact that Broun, considering the North American plants distinct from the Eurasian, bases a form of var. *americanum* upon a German type has already been commented on (p. 281).

Forma FILIFORME Lacks. ex Klinge, l. c. 406 (1882). Var. *nanum* Milde, Verhandl. Zool.-bot. Gesellsch. Wien. xiv. 13 (1864), Höheren Sporenpfl. 109 (1865) and Mon. Equiset. 328, t.

xiii, fig. 6 (1865). Forma *nanum* (as *nana*) (Milde) Luerss. l. c. 713 (1889), wrongly ascribed to Milde who had it as a var.

This extreme form, with very many essentially uniform filiform or capillary branches ascending from an abbreviated base was well illustrated by Milde. Klinge, publishing the herbarium-name of Lackschewitz, cited var. *nanum* Milde and especially his figure as the same form. It is well represented by such specimens as *Fernald & Long*, no. 1186 from Main River, Bonne Bay, Newfoundland; *Victorin*, no. 15,038 from Lac St.-Jean, Quebec; *A. A. Eaton*, no. 130, from Fort Kent, Maine; *Fernald & Pease*, no. 16,987 from Errol, New Hampshire.

THE USE OF DDT IN THE PREPARATION OF BOTANICAL SPECIMENS

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Botanists who collect plant materials in the tropics are confronted with the problem of protecting their plants from insect attacks while in the press and while in storage, once dry. Specimens are usually collected in large numbers, with reasonable care being taken to remove unsightly specimens or those badly infected with insects. The specimens are then placed between newspaper and dried rapidly over artificial heat or by slower solar heating. When dried, the plant specimens are tied in bundles and kept in a dry place until they can be shipped or brought back to the United States.

The amount of artificial heat used in drying specimens is rarely enough to kill the insects trapped in the flowers or fruits. Thus, during the storage period these insects may continue to destroy the specimen, or insect eggs may have an opportunity to hatch and the larvae feed on the dried plant material. The capacity of many insects in devouring plant specimens is amazing. In a relatively short time all the anthers and pollen, the complete flower, or in certain genera and families even the complete plant will be eaten by infesting or trapped insect pests.

In an attempt to control this insect deterioration of specimens, both in the drying process and while in storage, the author tried various combinations of commercial DDT during several months of collecting in the Dominican Republic last fall. Com-